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PATENT ABSTRACTS OF JAPAN

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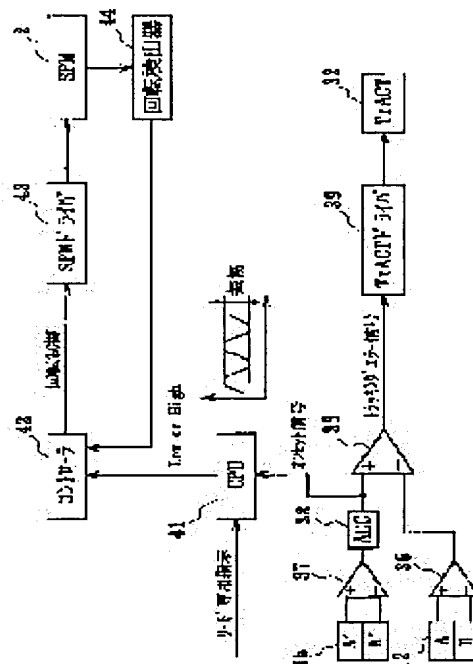
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(54) INFORMATION RECORDING AND REPRODUCING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an information recording and reproducing device which has a simple and inexpensive circuit constitution, properly controls the speed of revolution of a spindle motor, and effectively prevent the deterioration of characteristics of the recording and reproducing.

SOLUTION: The information recording and reproducing device has first detection means 12 and 35 which detect tracking error signals including an offset signal component corresponding to the shift from a prescribed position in the tracking direction of an objective 5 on the basis of the return light from a disk type recording medium 1, and second detection means 15 and 37 which detect only the offset signal on the basis of the return light from the disk type recording medium 1, a tracking error signal, in which the offset signal is removed by a differential arithmetic operation of the outputs from the first and the second detection means, is detected and the driving of the tracking actuator 32 is controlled on the basis of the tracking error signal, and the speed of revolution of the spindle motor 2 is controlled on the basis of the offset signal from the second detection means.



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CLAIMS

[Claim(s)]

[Claim 1]An object lens.

A support means which supports this object lens to a tracking direction which crosses a track of a disk shape recording medium so that displacement is possible, and a tracking actuator which drives the above-mentioned object lens to a tracking direction.

Are information storage playback equipment provided with the above, and based on returned light from the above-mentioned disk shape recording medium, The 1st detection means that detects a tracking error signal containing an offset signal ingredient corresponding to a shift from a prescribed position in a tracking direction of the above-mentioned object lens, Based on returned light from the above-mentioned disk shape recording medium, it has the 2nd detection means that detects only the above-mentioned offset signal, A tracking error signal which carried out the differential operations of the output of the above 1st and the 2nd detection means, and removed the above-mentioned offset signal is detected, It constituted so that a drive of the above-mentioned tracking actuator might be controlled based on the tracking error signal and number of rotations of the above-mentioned spindle motor might be controlled based on the above-mentioned offset signal from a detection means of the above 2nd.

[Claim 2]having a photodetector characterized by comprising the following — the above — three optical beams, even if small, The information storage playback equipment according to claim 1 constituting so that it may shift in the direction of the above-mentioned track, and the direction which intersects perpendicularly a half-beam every mostly, and it may cross and stand in a line to the above-mentioned parting line and the above-mentioned photodetector may be entered.

Optical beam separating mechanism from which a detection means of the above 2nd separates the above-mentioned returned light into at least three optical beams.

the above separated by this optical beam separating mechanism — even if small, three optical beams are received — as — about [of a beam diameter] — at least two light-receiving fields divided with one fourth of width by a parting line parallel to the direction of a track of the above-mentioned disk shape recording medium.

[Claim 3]It has six light-receiving fields divided in the direction of a track, and the direction which intersects perpendicularly by a parting line parallel to the direction of a track of the above-mentioned disk shape recording medium so that a detection means of the above 2nd may receive the above-mentioned returned light, It is in the state where four central light-receiving fields at least have about 1 of a beam diameter / four pieces, respectively and which does not have the above-mentioned shift, It is made to enter the above-mentioned returned light so that the outline may touch mostly a parting line of both sides of four light-receiving fields of a center of the above, The information storage playback equipment according to claim 1 constituting so that only the above-mentioned offset signal may be detected based on a difference of the sum of an output of the odd-numbered comrades of the six above-mentioned light-receiving fields, and the sum of an output of the even-numbered comrades.

[Claim 4]A detection means of the above 2nd in the direction of a track, and the direction which intersects perpendicularly by a parting line parallel to the direction of a track of the above-mentioned disk shape recording medium. In the state where it has four light-receiving fields divided with about 1 of a diameter of the above-mentioned returned light / four pieces, and there is no above-mentioned shift. It is made to enter the above-mentioned returned light so that the outer diameter line may touch mostly a parting line of both sides of the four above-mentioned light-receiving fields, The information storage playback equipment according to claim 1 constituting so that only the above-mentioned offset signal may be detected based on a difference of the sum of an output of the odd-numbered comrades of the four above-mentioned light-receiving fields, and the sum of an output of the even-numbered comrades.

[Claim 5]By position relations, irradiate the above-mentioned disk shape recording medium with three optical beams, and for a detection means of the above 2nd. Form a photodetector which receives returned light of at least two of three above-mentioned optical beams, respectively, and it constitutes with 2 division light-receiving field which divided each above-mentioned photodetector by a parting line parallel to the direction of a track, The information storage playback equipment according to claim 1 constituting so that only the above-mentioned offset signal may be detected based on the sum of output difference of 2 division light-receiving field of each photodetector.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the information storage playback equipment which performs record and/or reproduction of information to a disk shape recording medium.

[0002]

[Description of the Prior Art]In this kind of information storage playback equipment, chucking of the disk shape recording medium (only henceforth a disk) is carried out to the spindle of a spindle motor, A disk is rotated with a spindle motor, a disk is irradiated with an optical beam through an object lens from an optical pickup in the state, and it is made to perform record or playback of information.

[0003]When rotating a disk with a spindle motor in such information storage playback equipment, In addition to the eccentricity of the disk itself, change the eccentricity of a disk according to the chucking error of the disk to a spindle, and when the eccentricity is large, When the high velocity revolution of the disk is carried out, the frequency of a tracking error signal becomes high, the following error of the tracking actuator which drives an object lens to a tracking direction becomes large, and there is a problem that recording reproduction characteristics deteriorate.

[0004]As what solves such a problem, for example to JP,11-126419,A. Where the focus servo which drives an object lens to a focusing direction so that an optical beam may condense to the recording surface of a disk is applied, Eccentricity is measured based on a tracking error signal, and when the eccentricity is larger than a predetermined reference value, what lowers the number of rotations of a spindle motor and was made to make amplitude of the tracking error signal small is indicated.

[0005]

[Problem(s) to be Solved by the Invention]However, in the art of the above-mentioned JP,11-126419,A indication. In order to measure eccentricity based on a tracking error signal and to measure the eccentricity correctly, the large-scale and complicated circuitry which uses the clock per rotation of a spindle is needed, and there is a problem of causing a cost hike.

[0006]An object lens is prepared for a flexible region movable to a seeking direction in order to realize especially rapid access, Although he is trying for other optical systems containing a light source and the photodetector for signal detection to drive a flexible region with a voice coil motor generally in the information storage playback equipment which adopts what is called a separating optical system provided in a holding part, In this case, since it is difficult to fix a flexible region, eccentricity cannot be detected with high degree of accuracy, and the number of rotations of a this spindle motor cannot be controlled properly, but degradation of recording reproduction characteristics will be caused.

[0007]Therefore, the purpose of this invention made in view of this point is easy and cheap circuitry, can control the number of rotations of a spindle motor properly, and there is in providing the information storage playback equipment which can prevent degradation of recording reproduction characteristics effectively.

[0008]

[Means for Solving the Problem]A support means to which an invention concerning claim 1 which attains the above-mentioned purpose supports an object lens and this object lens to a tracking direction which crosses a track of a disk shape recording medium so that displacement is possible, An optical pickup which has a tracking actuator which drives the above-mentioned object lens to a tracking direction, The above-mentioned disk shape recording medium is irradiated with an optical beam through the above-mentioned object lens, having a spindle motor which rotates the above-mentioned disk shape recording medium, and rotating the above-mentioned disk shape recording medium with this spindle motor, In information storage playback equipment which performs record or reproduction of information, based on returned light from the above-mentioned disk shape recording medium, The 1st detection means that detects a tracking error signal containing an offset signal ingredient corresponding to a shift from a prescribed position in a tracking direction of the above-mentioned object lens, Based on returned light from the above-mentioned disk shape recording medium, it has the 2nd detection means that detects only the above-mentioned offset signal, Detect a tracking error signal which carried out the differential operations of the output of the above 1st and the 2nd detection means, and removed the above-mentioned offset signal, and a drive of the above-mentioned tracking actuator is controlled based on the tracking error signal, It constituted so that number of rotations of the above-mentioned spindle motor might be controlled based on the above-mentioned offset signal from a detection means of the above 2nd.

[0009]In the information storage playback equipment according to claim 1, an invention concerning claim 2 a

detection means of the above 2nd, the above separated by optical beam separating mechanism which divides the above-mentioned returned light into at least three optical beams, and this optical beam separating mechanism — so that three optical beams may be received even if small, It has a photodetector which has at least two light-receiving fields of a beam diameter divided with width of 4 by a parting line parallel to the direction of a track of the above-mentioned disk shape recording medium about 1/, the above — even if small, mostly, a half-beam every, it shifts, and it crosses to the above-mentioned parting line, and carries out having constituted so that it might stand in a line and the above-mentioned photodetector might be entered in the direction which intersects three optical beams perpendicularly with the direction of the above-mentioned track with the feature.

[0010]In the information storage playback equipment according to claim 1, an invention concerning claim 3 a detection means of the above 2nd, It has six light-receiving fields divided in the direction of a track, and the direction which intersects perpendicularly by a parting line parallel to the direction of a track of the above-mentioned disk shape recording medium so that the above-mentioned returned light may be received, It is in the state where four central light-receiving fields at least have about 1 of a beam diameter / four pieces, respectively and which does not have the above-mentioned shift, It is made to enter the above-mentioned returned light so that the outline may touch mostly a parting line of both sides of four light-receiving fields of a center of the above, It constituted so that only the above-mentioned offset signal might be detected based on a difference of the sum of an output of the odd-numbered comrades of the six above-mentioned light-receiving fields, and the sum of an output of the even-numbered comrades.

[0011]In the information storage playback equipment according to claim 1, an invention concerning claim 4 a detection means of the above 2nd, In the state where it has four light-receiving fields divided by having about 1 of a diameter of the above-mentioned returned light / four pieces in the direction of a track, and the direction which intersects perpendicularly by a parting line parallel to the direction of a track of the above-mentioned disk shape recording medium, and there is no above-mentioned shift. It is made to enter the above-mentioned returned light so that the outer diameter line may touch mostly a parting line of both sides of the four above-mentioned light-receiving fields, It constituted so that only the above-mentioned offset signal might be detected based on a difference of the sum of an output of the odd-numbered comrades of the four above-mentioned light-receiving fields, and the sum of an output of the even-numbered comrades.

[0012]In the information storage playback equipment according to claim 1, by position relations, an invention concerning claim 5 irradiates the above-mentioned disk shape recording medium with three optical beams, and for a detection means of the above 2nd. Form a photodetector which receives returned light of at least two of three above-mentioned optical beams, respectively, and it constitutes with 2 division light-receiving field which divided each above-mentioned photodetector by a parting line parallel to the direction of a track, It constituted so that only the above-mentioned offset signal might be detected based on the sum of output difference of 2 division light-receiving field of each photodetector.

[0013]

[Embodiment of the Invention]Hereafter, the embodiment of the information storage playback equipment by this invention is described with reference to drawings.

[0014]Drawing 1 is a figure showing the outline composition of the whole information storage playback equipment as a 1st embodiment. This information storage playback equipment adopts a separating optical system, to the lower part side of the disk 1 rotated with the spindle motor (SPM) 2, with the voice coil motor (VCM) 31, covers the radial direction of the disk 1 broadly, and stations the flexible region 3 movable. The reflecting member 4 which reflects in the flexible region 3 the light from the holding part mentioned later, and the object lens 5 which condenses the light reflected by this reflecting member 4 on the disk 1, The tracking actuator (TrACT) 32 which drives the object lens 5 [the minute range] to a radial direction, Perform a tracking servo by forming the focus actuator 33 which drives the object lens 5 in the direction of an optic axis (focus), and moving the flexible region 3 whole and/or the object lens 5 to the radial direction of the disk 1, and. It is made to perform a focus servo by moving the object lens 5 to a focusing direction. Via the publicly known elastic supporting means which is not illustrated in the flexible region 3, to a tracking direction and a focusing direction, the object lens 5 is supported so that displacement is possible.

[0015]On the other hand to the holding part 6 which constitutes a separating optical system with the flexible region 3. The laser diode 7 as a light source, the collimating lens 8, the 1st beam splitter 9, the 2nd beam splitter 10, the critical angle prism 11, the 1st photodetector 12, the grating 13, the condenser 14, and the 2nd photodetector 15 are formed.

[0016]In the information storage playback equipment shown in drawing 1, the optical beam emitted from the laser diode 7, After changing into a parallel pencil with the collimating lens 8, pass the 1st beam splitter 9, make it enter into the flexible region 3, it is made to reflect by the reflecting member 4 in this flexible region 3, and the recording layer of the disk 1 is made to condense with the object lens 5.

[0017]The catoptric light in the disk 1 enters into the 1st beam splitter 9 of the holding part 6 through the object lens 5 and the reflecting member 4, reflects the part here, and separates from an outward trip.

[0018]An outward trip and the returned light from the separated disk 1 are entered in the 2nd beam splitter 10 by the 1st beam splitter 9, and it separates into a 2-way, and an optical beam is reflected by the prism plane of the critical angle prism 11, and while it was detached that much receives light with the 1st photodetector 12. The 1st photodetector 12 is constituted with the quadrisected light-receiving field, and detects a focus error signal and a tracking error signal by a publicly known method based on those outputs.

[0019]On the other hand, after making it diffract by the grating 13, the optical beam of another side separated by

the 2nd beam splitter 10 condenses by the condenser 14, and receives light with the 2nd photodetector 15. On the 2nd photodetector 15, primary [**] light arranges the grating 13 so that only a half-spot may shift to the radial direction of the disk 1 to a zero order light. This grating 13 may be directly formed in the 2nd beam splitter 10, may be formed independently, and may be stuck on the 2nd beam splitter 10.

[0020] Here, the zero order light and primary [**] light in the grating 13 have caused intensity change asymmetrically to the radial direction, when the optical beam which enters into the disk 1 crosses the groove formed in the disk 1. Therefore, in the 2nd photodetector 15, if half-spot ***** light-receiving of the primary [**] light is carried out to a zero order light in a radial direction, the AC component of a tracking error signal is mostly cancellable [each spot intensity of a zero order light and primary / ** / light is made almost equal, and] so that it may mention later.

[0021] Drawing 2 is a figure showing the composition of the 2nd photodetector 15 shown in drawing 1. As shown in drawing 2, the 2nd photodetector 15 is constituted from a parting line parallel to the track direction of the disk 1 with the light-receiving fields 15a and 15b divided into two with the width of the abbreviation 1/4 of a spot diameter in a radial direction. The spot of the zero order light from the grating 13 (refer to drawing 1), the spot of primary [+] light, and the spot of -primary light are entered so that it may cross and may rank with a radial direction to the parting line of the half-spot ***** light-receiving fields 15a and 15b. Therefore, if the difference signal of the output of the light-receiving fields 15a and 15b is detected, only the offset signal produced when the object lens 5 shifts from a prescribed position according to the eccentricity of the disk 1 is detectable.

[0022] Namely, in the 1st photodetector 12, the tracking error signal containing an offset signal ingredient is detected. In the 2nd photodetector 15, a tracking error signal acquires the tracking error signal which removed the offset signal ingredient by detecting only the offset signal by the shift of the object lens 5 based on the eccentricity of the disk 1, and taking the difference signal of the output of these photodetectors, without detecting. The condenser 14 is not necessarily required.

[0023] Drawing 3 is a block diagram showing the composition of a digital disposal circuit. Since the 1st photodetector 12 comprises a quadrisection light-receiving field as mentioned above, While borders on a parting line parallel to the tangential direction, and a side The sum A of the output of two light-receiving fields. A difference with the sum B of the output of two near light-receiving fields of another side is calculated with the differential amplifier 35, the tracking error signal containing the offset signal ingredient by the shift of the object lens 5 is acquired, and the signal is supplied to one input terminal of the differential amplifier 36.

[0024] Each output A' of 2 division light-receiving fields 15a and 15b of the 2nd photodetector 15 and B', Differential operations are carried out with the differential amplifier 37, only the offset signal by the shift of the object lens 5 is detected, the gain adjustment of this offset signal is carried out in AGC circuit 38, and the input terminal of another side of the differential amplifier 36 is supplied.

[0025] In the differential amplifier 36, the tracking error signal included the offset signal from the differential amplifier 35, and the offset signal from the differential amplifier 37 by which the gain adjustment was carried out in AGC circuit 38 by carrying out differential operations. The tracking error signal which removed the offset signal is acquired, this tracking error signal is supplied to the TrACT driver 39, TrACT32 is driven, and this performs a tracking servo. About a focus servo, based on the output of the 1st photodetector 12, a focus error signal is detected by a critical angle method in a publicly known method and this case, and it carries out by driving the focus actuator 33 based on that focus error signal.

[0026] The offset signal from the differential amplifier 37 by which the gain adjustment was carried out in AGC circuit 38 is supplied to CPU41. By CPU41, based on the amplitude of an offset signal, detect the shift amount from the prescribed position of the tracking direction of the object lens 5, i.e., the eccentricity of the disk 1, and the reference value beforehand set to the detected eccentricity is compared. Based on the comparison result, the number of rotations of SPM2 is controlled via the SPM controller 42 and the SPM driver 43. The number of rotations of SPM2 is detected by the rotation detection circuit 44 using the clock obtained from the Hall device provided, for example in SPM2, supplies the detected number of rotations to the SPM controller 42, and carries out feedback control.

[0027] Drawing 4 is a flow chart for explaining revolving-speed-control operation of SPM2 by this embodiment. Here, two, the predetermined LOW rotation for convenience as number of rotations of SPM2 of explanation and HIGH rotation, shall be prepared beforehand, it shall choose those any they are, and the CAV drive of the disk 1 shall be carried out.

[0028] First, in the drive start of SPM2, point to LOW rotation from CPU41 to the SPM controller 42, and it controls to rotate SPM2 at predetermined LOW number of rotations (Step S1). Detect a focus error signal in the state, and a focus servo is turned ON, and as mentioned above, an offset signal detects the removed tracking error signal, and turns ON a tracking servo (Step S2).

[0029] Then, in CPU41, eccentricity is detected based on an offset signal (Step S3), and the reference value beforehand set to the detected eccentricity is compared (step S4). Here, when eccentricity is less than a reference value, it points to HIGH rotation from CPU41 to the SPM controller 42 (Step S5), and controls to rotate SPM2 at predetermined HIGH number of rotations via the SPM driver 43 by this (Step S6). On the other hand, LOW rotation is maintained when eccentricity is beyond a reference value in step S4.

[0030] According to this embodiment, when the cut off frequency of TrACT32 suppresses a tracking error in 0.1 micrometer at 3.5 kHz with a rough value, for example, eccentricity becomes that 24 micrometers can raise number of rotations to 160 Hz (9600 rpm). When eccentricity exceeds 24 micrometers and the amount of 48 micrometers

lower number of rotations to 113 Hz (6780 rpm), it can hold down to the tracking error in the same 0.1 micrometer. [0031] Although the number of rotations of SPM2 was controlled by the above-mentioned explanation in two steps, two or more reference values are set up and it can control by a multi stage story. What is necessary is just to make number of rotations high as it goes a disk area to the field by the side of disk inner circumference by dividing into three greatly, for example, since the disk most inner circumference becomes [number of rotations] high most about the disk 1 CLV or in carrying out a ZCAV drive.

[0032] The acceptable value of a tracking error is also changeable not only according to 0.1 micrometer but a use. For example, as shown in drawing 3 also in the case of a ROM disk and a record reproduction disk, when the command used for CPU41 only for a lead from a higher rank is inputted. CPU41 can raise the acceptable value of a tracking error to 0.2 micrometer from 0.1 micrometer, can give the high velocity revolution directions corresponding to 0.2 micrometer of tracking errors to the SPM controller 42, and can also rotate SPM2 more at high speed. When it writes in CPU41 and directions are inputted, it controls similarly with having lowered the acceptable value of the tracking error to 0.1 micrometer from 0.2 micrometer, and having mentioned it above.

[0033] Also when the temperature in a device rises and a recording condition worsens, if a temperature sensor detects the temperature in a device and the detection temperature reaches a predetermined reference value, it can respond by making the acceptable value of a tracking error severe like the above, and making the number of rotations of SPM2 low. Also when similarly the track pitch of the disk 1 is narrow and storage density is high, it can respond by making the acceptable value of a tracking error severe and making the number of rotations of SPM2 low.

[0034] Drawing 5 (a) and (b) is a figure showing two modifications of the 2nd photodetector 15 used for a 1st embodiment shown in drawing 1. Although he is trying to acquire the tracking error signal containing an offset signal ingredient from the output of the 1st photodetector 12 in a 1st embodiment shown in drawing 1, it is shown in drawing 5 (a) — as — each of the spot of the primary [**] light on the 2nd photodetector 15 — so that a left half and a right half may be received, The light-receiving fields 15c and 15d can be arranged beside the light-receiving fields 15a and 15b, and the tracking error signal containing an offset signal ingredient can also be acquired by calculating the difference of a these light-receiving fields [15c and 15d] output.

[0035] As shown in drawing 5 (b), arrange the light-receiving fields 15e and 15f beside the center section in which the spot of the zero order light of the light-receiving fields 15a and 15b of the 2nd photodetector 15 is formed, and the left end and right end of a spot of a zero order light are received, It may be made to acquire the tracking error signal which calculates the difference of a these light-receiving fields [15e and 15f] output, and contains an offset signal ingredient.

[0036] Drawing 6 is a figure for describing a 2nd embodiment of the information storage playback equipment by this invention. According to a 2nd embodiment, it replaces with the grating 13 in a 1st embodiment shown in drawing 1, and a hologram is formed in the 2nd beam splitter 10.

[0037] As shown in drawing 6, it constitutes with 6 division light-receiving fields 15g-15l, primary [**] light arranges and enters on the light-receiving field 15i and 15l, and the 2nd photodetector 15 arranges a zero order light so that it may start and enter into the light-receiving fields 15g, 15h, 15j, and 15k.

[0038] According to this embodiment, the offset signal of the tracking direction of the object lens 5 is $(g+h+i)-(j+k+l)$.

Since it is obtained by calculating, supply this offset signal to CPU41 like a 1st embodiment, control the number of rotations of SPM2, and. The tracking error signal which subtracted from the tracking error signal containing the offset signal ingredient obtained based on the output of the 1st photodetector 12 in this offset signal, and removed the offset signal ingredient is acquired, This drives TrACT32 via the TrACT driver 39, and a tracking servo is performed.

[0039] It may be made for a hologram to give the same hologram effect as the condenser 14 instead of forming in the 2nd beam splitter 10.

[0040] Drawing 7 is a figure for describing a 3rd embodiment of the information storage playback equipment by this invention. As the grating 13 shown in drawing 1 is removed in this embodiment and it is shown in drawing 7 (a) as the 2nd photodetector, The photodetector 16 which has the light-receiving fields a-f divided into six is used for a radial direction by a parting line parallel to the direction of the track of a disk, In the state where there is no shift in an object lens, returned light is entered so that the outline may touch mostly the four light-receiving fields a, b, and d of a center section and the parting line of the both sides of e, i.e., the parting line of the light-receiving fields b and c, and the parting line of the light-receiving fields e and f.

[0041] The detection principles of the tracking error signal in this embodiment are as follows. The composition which trichotomized into the track direction the light-receiving fields 15a and 15b of the 2nd photodetector shown in drawing 5 (a), respectively is shown in drawing 7 (b). That is, the light-receiving fields 15a and 15b of the 2nd photodetector 15 shown in drawing 5 (a) are divided into the six light-receiving fields a, b, and c, d, e, and f, and these fields correspond to the six light-receiving fields a, b, and c of the photodetector 16 shown in drawing 7 (a), d, e, and f, respectively.

[0042] In the photodetector shown in drawing 7 (b), an offset signal is acquired from the sum of the output of the light-receiving field 15a b, d, and f, i.e., a light-receiving field, by subtracting the sum of the output of the light-receiving field 15b a, c, and e, i.e., a light-receiving field. Difference $(b+d+f)-(a+c+e)$ of the sum of the operation, i.e., the output of the odd-numbered comrades of six light-receiving fields, same also at the photodetector 16 shown in drawing 7 (a), and the sum of the output of the even-numbered comrades

An offset signal can be acquired by calculating. Therefore, the photodetector shown in the photodetector 16 shown in drawing 7 (a), drawing 7 (b), or drawing 5 (a) is functional superiors value.

[0043] Here, the tracking error signal containing an offset signal ingredient is $(a+b+c)-(d+e+f)$.

Since it is obtained by calculating, the tracking error signal which removed the offset signal can be acquired by carrying out the gain adjustment of the above-mentioned offset signal, and subtracting it from this signal.

[0044] According to a 3rd embodiment, an offset signal and the tracking error signal which removed this can be acquired from one returned light spot, without using the beam diffraction means of grating 13 grade. Therefore, part mark and an adjustment man hour can be reduced, and a cost cut can be aimed at, and a miniaturization can be attained. Since composition becomes easy, combination with a detection system of a focus error signal can also be performed easily.

[0045] Drawing 8 is a figure for describing a 4th embodiment of the information storage playback equipment by this invention. It replaces with the photodetector 16 of drawing 7 (a) used by a 3rd embodiment in this embodiment, the quadrisection photodetector 17 as shown in drawing 8 except the light-receiving fields c and f of the both outsides is used, and it is $(b+d)-(a+e)$.

It calculates and an offset signal is acquired. The tracking error signal containing an offset signal ingredient is detected like a 1st embodiment based on the output of the 1st photodetector 12 shown in drawing 1. About about 1 of the diameter of the beam spot / 4 may be sufficient as the division width of each light-receiving field of the photodetector 17 shown in the photodetector 16 shown in drawing 7, or drawing 8, and it is not specified strictly.

[0046] Drawing 9 is a figure for describing a 5th embodiment of the information storage playback equipment by this invention. The pattern 18a which has the light-receiving field b, d, and f for the photodetector 16 in a 3rd embodiment in this embodiment, It constitutes with the pattern 18b which has the light-receiving field a, c, and e, the difference of the output of these patterns 18a and 18b is calculated, and an offset signal is detected. The tracking error signal containing an offset signal ingredient is detected like a 1st embodiment based on the output of the 1st photodetector 12 shown in drawing 1.

[0047] According to this embodiment, since it becomes unnecessary to be able to acquire an offset signal by calculating the difference of the output of the patterns 18a and 18b, and to perform the add operation of each light-receiving field as in a 3rd embodiment, the quick control of it is attained.

[0048] Drawing 10 is a figure for describing a 6th embodiment of the information storage playback equipment by this invention. This embodiment receives light with the photodetector 19 which gives astigmatism to the returned light from a disk and is shown in drawing 10, and detects the tracking error signal which removed the offset signal and the offset signal based on the output, and a focus error signal.

[0049] The photodetector 19 divides an upper part half into six at light-receiving field a-f, and a bottom half is divided into the light-receiving fields g and h two, and it constitutes it. Thus, $(g-h)/(g+h)$

Or $\{(a+b+c+g)-(d+e+f+h)/(a+b+c+d+e+f+g+h)$

The tracking error signal which calculates and contains an offset signal ingredient is detected, and it is $\{(b+d+f)-(a+c+e)/(a+b+c+d+e+f+g+h)$.

It calculates, an offset signal is detected and the tracking error signal which removed the offset signal is acquired by subtracting this offset signal from the tracking error signal containing the above-mentioned offset signal ingredient.

A focus error signal is $\{(a+b+c+h)-(d+e+f+g)/(a+b+c+d+e+f+g+h)$ by astigmatic method.

It calculates and detects.

[0050] Drawing 11 is a figure for describing a 7th embodiment of the information storage playback equipment by this invention. This embodiment converges and divides the returned light from a disk into two, and is the front of a focal plane about one convergence light, The convergence light of another side is received by photodetector 20-1, 20-2 shown in drawing 11 behind a focal plane, respectively, and an offset signal, the tracking error signal which removed the offset signal ingredient, and a focus error signal are detected based on those outputs.

[0051] Photodetector 20-1, 20-2 is trichotomized by the parting line which intersects perpendicularly with a track direction, respectively, and the light-receiving field of the center of the photodetector 20-2 is further divided into six by a parting line parallel to a track direction at light-receiving field a-f. Here, g, h, and the trichotomy light-receiving field of the photodetector 20-1 are set to i, j, and k for the light-receiving field of the upper and lower sides of the photodetector 20-2.

[0052] Thus, $\{(a+b+c)-(d+e+f)/(a+b+c+d+e+f)$

The tracking error signal which calculates and contains an offset signal ingredient is detected, and it is $\{(b+d+f)-(a+c+e)/(a+b+c+d+e+f)$.

It calculates, an offset signal is detected and the tracking error signal which removed the offset signal is acquired by subtracting this offset signal from the tracking error signal containing the above-mentioned offset signal ingredient.

A focus error signal is $\{(j+g+h)-(i+k+a+b+c+d+e+f)/(a+b+c+d+e+f+g+h+i+j+k)$ by the beam size method.

It calculates and detects.

[0053] Drawing 12 is a figure for describing an 8th embodiment of the information storage playback equipment by this invention. This embodiment receives light with the photodetector 21 which converges the returned light from a disk, shades the half of the convergence light by knife edge, and is shown in drawing 12, Based on the output, an offset signal, the tracking error signal which removed the offset signal ingredient, and a focus error signal are detected.

[0054] The photodetector 21 is divided into two by a parting line parallel to the bowstring of the spot of the entering convergence light, and further, an upper part half is divided into light-receiving field a-f six, and it constitutes it in it.

[0055] Thus, $\{(a+b+c)-(d+e+f))/(a+b+c+d+e+f)$

The tracking error signal which calculates and contains an offset signal ingredient is detected, and it is $\{(b+d+f)-(a+c+e))/(a+b+c+d+e+f)$.

It calculates, an offset signal is detected and the tracking error signal which removed the offset signal is acquired by subtracting this offset signal from the tracking error signal containing the above-mentioned offset signal ingredient. A focus error signal is $\{(a+b+c+d+e+f) - g)/(a+b+c+d+e+f+g)$ by the knife-edge method.

It calculates and detects.

[0056] Since the 1st photodetector 12 shown in drawing 1 becomes unnecessary according to the 6th explained by drawing 10 - drawing 12 - an 8th embodiment, it can reduce further and part mark and an adjustment man hour can be made simply and cheap.

[0057] This invention is applicable effective not only in the information storage playback equipment of the discrete type mentioned above but integral-type information storage playback equipment. In this integral type, as indicated by JP,61-94246,A, for example, Also when glaring so that sub beams may have a track pitch interval for three beams which have one main beam and two sub beams in a disk shape recording medium and the interval of a main beam and a sub beam may have 1/2 track pitch, this invention can be applied effectively. In this case, the signal which carried out the gain adjustment of the output difference of 2 division light-receiving field of the photodetector which receives light with the photodetector which has the light-receiving field which divided the returned light of each beam into two by the parting line parallel to the direction of a track, and receives at least one sub beam, Add the output difference signal of 2 division light-receiving field of the photodetector which receives a main beam, detect only an offset signal, and control the number of rotations of SPM based on this offset signal, and. It subtracts from the tracking error signal containing the offset signal ingredient obtained by the 3 beam method in an offset signal, the tracking error signal which removed the offset signal ingredient is acquired, and this performs a tracking servo.

[0058] Also when sub beams have 1 / 2 track pitch intervals in a disk shape recording medium and they irradiate it with three beams which have one main beam and two sub beams as indicated by JP,7-320287,A, this invention can be applied effectively. In this case, light is received with the photodetector which has the light-receiving field which divided the returned light of each sub beam into two like the above, By adding the output difference of 2 division light-receiving field of each photodetector, detect only an offset signal, and the number of rotations of SPM is controlled like the above-mentioned case using this offset signal, and a tracking servo is performed.

[0059]

[Effect of the Invention] As mentioned above, since according to this invention the offset signal by the shift of an object lens is detected using the returned light from a disk shape recording medium and the number of rotations of the spindle motor was controlled based on the offset signal, Even when adopting a separating optical system, the number of rotations of a spindle motor can be properly controlled by easy and cheap circuitry, the following error resulting from the eccentricity by the chucking error to the eccentricity and the spindle motor of the disk shape recording medium itself can be controlled, and degradation of recording reproduction characteristics can be prevented effectively.

[Translation done.]

の偏心量が所定の基準値以下でも大きい場合には、スピンドルモータの回転数を下げてトラッキングエラー信号の振幅を小さくするようにしたものが開示されている。

【0005】
【発明が解決しようとする課題】しかしながら、上記の特開平11-126419号公報開示の技術では、トラッキングエラー信号に基づいて偏心量を測定するため、その偏心量を正確に測定するためには、スピンドルの1回転あたりのクロックを使用した大きかりで複雑な回路構成を必要とし、コストアップを招くという問題がある。

【0006】また、特に高速アクセスを要するためには、対物レンズはシーク方向に移動可能な可動部に設け、光源や信号検出用の光検出器を含む他の光学系は固定部に設けられるいわゆる分離光学系を採用する情報記録再生装置では、一般に可動部をボイスコイルモータによって駆動するようになっているが、この場合には可動部を固定するが難しいため、偏心量を高精度で検出することができず、これがためスピンドルモータの回転数を適正に制御することができず、記録再生特性の劣化を招くことになる。

【0007】したがって、かかる点に鑑みなくてはならぬ本発明の目的は、簡単な安価な回路構成で、スピンドルモータの回転数を適正に制御でき、記録再生特性の劣化を有効に防止できる情報記録再生装置を提供することにある。

【0008】
【課題を解決するための手段】上記目的を達成する請求項1に係る発明は、対物レンズと、該対物レンズをディスタンス媒体のトラックを横切るトラッキング方向に変位可能に支持する支持手段と、上記対物レンズをトラッキング方向に駆動するトラッキングアクチュエータとを有する光ビックアップと、上記ディスタンス媒体を有する光ビックアップと、上記ディスタンス媒体に光ビームを照射して、情報の記録または再生を行う情報記録再生装置において、上記ディスタンス媒体からの戻り光に基づいて、上記対物レンズのトラッキング方向における所定位置からのシフトに対応するオフセット信号成分を含むトラッキングエラー信号を検出する第1の検出手段と、上記ディスタンス媒体からの戻り光に基づいて、上記オフセット信号のみを検出する第2の検出手段とを有し、上記第1および第2の検出手段の出力を差動演算して上記オフセット信号を除去したトラッキングエラー信号を算出し、そのトラッキングエラー信号に基づいて上記トラッキングアクチュエータの駆動を制御し、上記第2の検出手段からの上記オフセット信号に基づいて上記スピンドルモータの回転数を制御するよう構成したことを特徴とするものである。

【0009】請求項2に係る発明は、請求項1に記載の情報記録再生装置において、上記第2の検出手段は、上記戻り光を少なくとも3本の光ビームに分離する光ビーム分離手段と、該光ビーム分離手段で分離された上記少なくとも3本の光ビームを受光するように、ビーム直径のほぼ1/4の幅をもって上記ディスタンス媒体のトラッキング方向と平行な分割線で分割された少なくとも2つの受光領域を有する光検出器とを有し、上記少なくとも3本の光ビームを、上記トラッキング方向と直交する方向にほぼ半ビームずつ入れ、かつ上記分割線に対して交差して並ぶように上記光検出器に入射させるよう構成したことを特徴とするものである。

【0010】請求項3に係る発明は、請求項1に記載の情報記録再生装置において、上記第2の検出手段は、上記戻り光を受光するように、上記ディスタンス媒体のトラッキング方向と平行な分割線でトラッキング方向と直交する方向に分割された6個の受光領域を有し、その少なくとも中央の4個の受光領域はそれぞれビーム直径のほぼ1/4幅を有しており、上記シフトがない状態で、上記戻り光をその外形線が上記中央の4個の受光領域の間の分割線にほぼ被せられるように入射させるようにして、上記6個の受光領域の各数番目どうしの出力の和と、偶数番目どうしの出力の和との差に基づいて上記オフセット信号のみを検出するよう構成したことを特徴とするものである。

【0011】請求項4に係る発明は、請求項1に記載の情報記録再生装置において、上記第2の検出手段は、上記ディスタンス媒体のトラッキング方向と平行な分割線でトラッキング方向と直交する方向に、上記戻り光の直径のほぼ1/4幅をもって分割された4個の受光領域を有しており、上記シフトがない状態で、上記戻り光をその外縁線が上記4個の受光領域の両側の分割線にほぼ被せられるように入射させるようにして、上記4個の受光領域の奇数番目どうしの出力の和と、偶数番目どうしの出力の和との差に基づいて上記オフセット信号のみを検出するよう構成したことを特徴とするものである。

【0012】請求項5に係る発明は、請求項1に記載の情報記録再生装置において、上記ディスタンス媒体に所定の位置関係で3本の光ビームを照射し、上記第2の検出手段には、上記3本の光ビームのうち少なくとも2本の光ビームの戻り光をそれぞれ受光する光検出器を設け、上記各光検出器を、トラッキング方向と平行な分割線で分割した2分割受光領域をもって構成して、各光検出器の2分割受光領域の出力差の和に基づいて上記オフセット信号のみを検出するよう構成したことを特徴とするものである。

【0013】
【発明の実施の形態】以下、本発明による情報記録再生装置の実施の形態について図面を参照して説明する。

【0014】図1は第1実施の形態としての情報記録再生

に直接形成してもよいし、独立して形成して第2のビームスプリッタ10に出力付けてもよい。

【0020】ここで、グレーティング13での0次光および±1次光は、ディスク1に入射する光ビームがディスク1に形成されたグルーブを横切ることににより、ラジアル方向に非対称に強度変化を起こしている。したがって、0次光および±1次光の各スポット強度をほぼ等しくして、第2の光検出器15においては、0次光に対して±1次光をラジアル方向に半スポットずらせて受光すれば、後述するようにトラッキングエラー信号のAC成分をほぼキャンセルすることができる。

【0021】図2は、図1に示す第2の光検出器15の構成を示す図である。図2に示すように、第2の光検出器15はスポット径の約1/4の幅をもってディスク1のトラッキング方向と平行な分割線でラジアル方向に2分割した受光領域15a、15bをもって構成し、グレーティング13（図1参照）からの0次光のスポット、±1次光のスポット、-1次光のスポットを、ラジアル方向に半スポットずらせて受光領域15a、15bの分割線に対して交差して並ぶように入射させる。したがって、受光領域15a、15bの出力の差信号を検出すれば、ディスク1の偏心に応じて対物レンズ5が所定位置からシフトしたときに生じるオフセット信号のみを検出することができる。

【0022】すなわち、第1の光検出器12では、オフセット信号成分を含むトラッキングエラー信号を検出し、第2の光検出器15ではトラッキングエラー信号は検出せずに、ディスク1の偏心に基づいて対物レンズ5のシフトによるオフセット信号のみを検出し、これらの光検出器の出力の差信号を取ることによって、オフセット信号成分を除去したトラッキングエラー信号を得る。なお、集光レンズ14は必ずしも必要ではない。

【0023】図3は、信号処理回路の構成を示すブロック図である。上述したように、第1の光検出器12は4分割受光領域から構成されているので、タンジェンシャル方向に平行な分割線と斜とする一方の側の2個の受光領域の出力の和Aと、他方の側の2個の受光領域の出力の和Bとの差を差動増幅器35で演算して、対物レンズ5のシフトによるオフセット信号成分を含むトラッキングエラー信号を得、その信号を差動増幅器36の一方の入力端子に供給する。

【0024】また、第2の光検出器15の2分割受光領域15a、15bのそれぞれの出力A'、B'は、差動増幅器37で差動演算して対物レンズ5のシフトによるオフセット信号のみを検出し、このオフセット信号をAGC回路38でゲイン調整して差動増幅器36の他方の入力端子に供給する。

【0025】差動増幅器36では、差動増幅器35からオフセット信号を含んだトラッキングエラー信号と、AGC回路38でゲイン調整された差動増幅器37から

のオフセット信号とを差動減算することで、オフセット信号を除いたトラッキングエラー信号を得、このトラッキングエラー信号をT r A C Tドライバ39に供給してT r A C T32を駆動し、これによりトラッキングサーボを行なう。なお、フォーカスサーボについては、第1の光検出器12の出力に基づいて公知の方法、この場合は臨界角法によりフォーカスエラー信号を検出し、そのフォーカスエラー信号に基づいてフォーカスアクチュエータ33を駆動して行う。

【0026】また、A G C回路38でゲイン調整された差動増幅器37からのオフセット信号は、C P U 41に供給する。C P U 41では、オフセット信号の検出に基づいて対物レンズ5のトラッキング方向の所定位置からのシフト量、すなわちディスク1の偏心率を検出し、その比較結果に基づいてS P M 2の回転数を制御する。また、S P M 2の回転数は、例えばS P M 2に設けられたホール素子から得られるクロックを利用して回転検出器44で検出し、その検出した回転数をS P M 2コントローラ42に供給してフィードバック制御する。

【0027】図4は本実施の形態によるS P M 2の回転数制御動作を説明するためのフローチャートである。ここでは、説明の便宜上、S P M 2の回転数として所定のL O W回転とH I G H回転との二つを予め用意し、それの何れかを選択してディスク1をC A V駆動するものとする。

【0028】先ず、S P M 2の駆動開始においては、C P U 41からS P M 2コントローラ42へL O W回転を指示してS P M 2を所定のL O W回転で回転させるよう制御し(ステップS1)、その状態でフォーカスエラー信号を検出してフォーカスサーボをO Nにすると共に、上述したようにオフセット信号が除去されたトラッキングエラー信号を検出してトラッキングサーボをO Nにする(ステップS2)。

【0029】その後、C P U 41においてオフセット信号に基づいて偏心率を検出し(ステップS3)、その検出した偏心率と予め設定した基準値とを比較する(ステップS4)。ここで、偏心率が基準値未満のときは、C P U 41からS P M 2コントローラ42へH I G H回転を指示し(ステップS5)、これによりH I G H回転で回転させるように制御する(ステップS6)。これに対し、ステップS4で偏心率が基準値以上のときは、L O W回転を維持する。

【0030】本実施の形態によると、例えばT r A C T32のカットオフ周波数が概算値で3.5 K H zで、トラッキング誤差が0.1 μ m内に抑える場合には、偏心率が2.4 μ m相当までは1.6 O H z (9.6 0 0 r p m)まで回転数を上げることが可能となる。また、偏心率が

2.4 μ mを超え4.8 μ m相当までは11.3 H z (6.7 8 0 r p m)まで回転数を下げることにより同じ0.1 μ m内のトラッキング誤差に抑えることができる。

【0031】なお、上記の説明ではS P M 2の回転数を2段階で制御するようにしたが、複数の基準値を設定して多段階で制御するようにすることもできる。また、ディスク1をC L VまたはZ C A V駆動する場合には、ディスク最内周が一番回転数が高くなるので、例えばディスク領域を大きく3つに分けてディスク内周側の領域に行くに従って回転数を高くすればよい。

【0032】さらに、トラッキング誤差の許容値は0.1 μ mに限らず、用途に応じて変えることもできる。例えば、R O Mディスクや記録再生ディスクの場合でも、図3に示すように、C P U 41に上位からリード専用で使うコマンドが入力された場合には、C P U 41はトラッキング誤差の許容値を0.1 μ mから0.2 μ mに上げて、トラッキング誤差0.2 μ mに対応する高速回転指示をS P M 2コントローラ42に与えて、S P M 2をより高速で回転させることもできる。なお、C P U 41に書き込み指示が入力された場合には、トラッキング誤差の許容値を0.2 μ mから0.1 μ mに下げて、上述したと同様に制御する。

【0033】また、装置内の温度が上昇して記録条件が悪くなる場合にも、装置内の温度を温度センサで検出し、その検出温度が所定の基準値に達したら上記と同様にトラッキング誤差の許容値を緩くしてS P M 2の回転数を低くすることで対応可能である。同様に、ディスク1のトラッキングピッチが狭く、記録密度が高い場合にも、トラッキング誤差の許容値を緩くしてS P M 2の回転数を低くすることで対応可能である。

【0034】図5(a)および(b)は、図1に示す第1実施の形態に使用する第2の光検出器15の二つの変形例を示す図である。図1に示した第1実施の形態では、第1の光検出器12の出力からオフセット信号成分を含むトラッキングエラー信号を得るようにしているが、図5(a)に示すように、第2の光検出器15上の ± 1 次光のスポットのそれぞれ左半分、右半分を受光するように、受光領域15a、15bの間に受光領域15c、15dを配置し、これら受光領域15c、15dの出力の差を減算することによってオフセット信号成分を含むトラッキングエラー信号を得ることもできる。

【0035】また、図5(b)に示すように、第2の光検出器15の受光領域15a、15bの0次光のスポットが形成される中央部の横に受光領域15e、15fを配置して0次光のスポットの左端と右端とを受光し、これら受光領域15e、15fの出力の差を減算してオフセット信号成分を含むトラッキングエラー信号を得るようにしてもよい。

【0036】図6は、本発明による情報記録再生装置の第2実施の形態を説明するための図である。第2の実施

の形態では、図1に示した第1実施の形態においてグレーディング13に代えて第2のビームスプリッタ10にホログラムを形成する。

【0037】第2の光検出器15は、図6に示すように6分割受光領域15g~15lをもつて構成し、 ± 1 次光が受光領域15i、15l上に並べて入射し、0次光は受光領域15e、15h、15j、15kにかかって入射するように配置する。

【0038】この実施の形態によると、対物レンズ5のトラッキング方向のオフセット信号は、

$$(g+h+i)-(j+k+l)$$

を減算することにより得られるので、このオフセット信号を第1実施の形態と同様にC P U 41に供給して、S P M 2の回転数を制御すると共に、このオフセット信号を第1の光検出器12の出力に基づいて得られるオフセット信号成分を含むトラッキングエラー信号から減算してオフセット信号成分を除去したトラッキングエラー信号を得、これによりT r A C Tドライバ39を介してT r A C T32を駆動してトラッキングサーボを行なう。

【0039】なお、ホログラムは、第2のビームスプリッタ10に形成する代わりに、集光レンズ14に同様のホログラム効果を持たせるようにしてもよい。

【0040】図7は、本発明による情報記録再生装置の第3実施の形態を説明するための図である。本実施の形態では、図1に示すグレーディング13を取り除き、第2の光検出器として図7(a)に示すように、ディスク1のトラックの方向と平行な分割線でラジアル方向に6分割した受光領域a~fを有する光検出器16を用い、対物レンズにシフトがない状態で戻り光をその外形線が中央部の4個の受光領域a、b、d、eの両側の分割線、すなわち受光領域b、cの分割線および受光領域e、fの分割線にほぼ接するように入射させる。

【0041】本実施の形態におけるトラッキングエラー信号の検出原理は以下の通りである。図5(a)に示す第2の光検出器の受光領域15a、15bをそれぞれラック方向に3分割した構成を図7(b)に示す。すなわち、図5(a)に示す第2の光検出器15の受光領域15a、15bは8つの受光領域a、b、c、d、e、fに分割され、これらの領域は図7(a)に示す光検出器16の6個の受光領域a、b、c、d、e、fにそれぞれ対応する。

【0042】図7(b)に示す光検出器では、受光領域15aすなわち受光領域b、d、fの出力の和から、受光領域15bすなわち受光領域a、c、eの出力の和を減算することによりオフセット信号が得られる。図7(a)に示す光検出器16でも同様の減算、すなわち6個の受光領域の各数値目どうしの出力の和と、偶数番号どうしの出力の和との差

$$(b+d+f)-(a+c+e)$$

を減算することによりオフセット信号を得ることができ

る。したがって、図7(a)に示す光検出器16と図7(b)、あるいは図5(a)に示す光検出器とは機能上等価である。

【0043】ここで、オフセット信号成分を含むトラッキングエラー信号は、
(a+b+c)-(d+e+f)
を減算することにより得られるので、この信号から上述のオフセット信号をゲイン調整して減算することにより、オフセット信号を除去したトラッキングエラー信号を得ることができる。

【0044】第3実施の形態によれば、グレーディング13等のビーム回折手段を用いことなく、1つの戻り光スポットからオフセット信号これを除去したトラッキングエラー信号とを得ることができる。したがって、部品点数および調整工数を削減でき、コストダウンを図ることができると共に、小型化を図ることができる。また、構成が簡単になるのでフォーカスエラー信号の検出系との組合せも簡単に行うことができる。

【0045】図8は、本発明による情報記録再生装置の第4実施の形態を説明するための図である。本実施の形態では、第3実施の形態で使用する図7(a)の光検出器16に代えて、その向外面の受光領域cおよびfを除いた図8に示すような4分割光検出器17を用い、

$$(b+d)-(a+e)$$

を減算してオフセット信号を得る。また、オフセット信号成分を含むトラッキングエラー信号は、第1実施の形態と同様に、図1に示す第1の光検出器12の出力に基づいて検出する。なお、図7に示す光検出器16あるいは図8に示す光検出器17の各受光領域の分割幅はビームスポットの直径のほぼ1/4程度でよく、厳密に規定されるものではない。

【0046】図9は、本発明による情報記録再生装置の第5実施の形態を説明するための図である。本実施の形態では、第3実施の形態における光検出器16を、受光領域b、d、fを有するパターン18aと、受光領域a、c、eを有するパターン18bとをもつて構成し、これらパターン18a、18bの出力の差を減算してオフセット信号成分を含むトラッキングエラー信号は、
(a+b+c)-(d+e+f)
を減算することにより得られるので、この信号から上述のオフセット信号をゲイン調整して減算することにより、オフセット信号を除去したトラッキングエラー信号を得ることができる。

【0047】本実施の形態によると、オフセット信号は、パターン18a、18bの出力の差を減算することにより得ることができ、第3実施の形態におけるように各受光領域の加算減算を行う必要がなくなるので、迅速な制御が可能となる。

【0048】図10は、本発明による情報記録再生装置の第6実施の形態を説明するための図である。本実施の形態は、ディスクからの戻り光に非点収差を与えて図10に示す光検出器19で受光し、その出力に基づいてオ

11

フセット信号、オフセット信号を除去したトラッキングエラー信号、およびフォーカスエラー信号を抽出するようにしたものである。

【0049】光検出器19は、上側半分を受光領域a～fに6分割し、下側半分を受光領域g、hに2分割して構成する。このようにして、

もしくは

$$f(a+b+c+g) - (d+e+f+h) \quad (1) \quad (a+b+c+d+e+f+g+h)$$

を演算してオフセット信号成分を含むトラッキングエラー信号を抽出すると共に、

$$(b+d+f) - (a+c+e) \quad (2) \quad (a+b+c+d+e+f+g+h)$$

を演算してオフセット信号を抽出し、このオフセット信号を上記のオフセット信号成分を含むトラッキングエラー信号から減算することで、オフセット信号を除去したトラッキングエラー信号を得る。また、フォーカスエラー信号は、非点収差法により

$$(a+b+c+h) - (d+e+f+g) \quad (3) \quad (a+b+c+d+e+f+g+h)$$

を演算して抽出する。

【0050】図11は、本発明による情報記録再生装置の第7実施の形態を説明するための図である。本実施の形態は、ディスクからの戻り光を収束して2分割し、一方の収束光を焦点面の前方で、他方の収束光を焦点面の後方でそれぞれ図11に示す光検出器20-1、20-2で受光し、それらの出力に基づいてオフセット信号、オフセット信号成分を除去したトラッキングエラー信号、およびフォーカスエラー信号を抽出するようにしたものである。

【0051】光検出器20-1、20-2は、それぞれトラック方向に直交する分割線で3分割し、さらに光検出器20-2の中央の受光領域はトラック方向に平行な分割線で受光領域a～fに6分割する。ここで、光検出器20-2の上下の受光領域をg、h、光検出器20-1の3分割受光領域をi、j、kとする。

【0052】このようにして、

$$(a+b+c) - (d+e+f) \quad (4) \quad (a+b+c+d+e+f)$$

を演算してオフセット信号成分を含むトラッキングエラー信号を抽出すると共に、

$$(b+d+f) - (a+c+e) \quad (5) \quad (a+b+c+d+e+f)$$

を演算してオフセット信号を抽出し、このオフセット信号を上記のオフセット信号成分を含むトラッキングエラー信号から減算することで、オフセット信号を除去したトラッキングエラー信号を得る。また、フォーカスエラー信号は、ビームサイズ法により

$$(j+g+h) - (i+k+a+b+c+d+e)$$

12

$$f) \quad (1) \quad (a+b+c+d+e+f+g+h+i+j+k)$$

を演算して抽出する。

【0053】図12は、本発明による情報記録再生装置の第8実施の形態を説明するための図である。本実施の形態は、ディスクからの戻り光を収束し、その収束光の半分をナイフエッジで遮光して図12に示す光検出器21で受光し、その出力に基づいてオフセット信号、オフセット信号成分を除去したトラッキングエラー信号、およびフォーカスエラー信号を抽出するようにしたものである。

【0054】光検出器21は、入射する収束光のスポットの弦に平行な分割線で2分割し、さらに上側半分は受光領域a～fに6分割して構成する。

【0055】このようにして、

$$(a+b+c) - (d+e+f) \quad (6) \quad (a+b+c+d+e+f)$$

を演算してオフセット信号成分を含むトラッキングエラー信号を抽出すると共に、

$$(b+d+f) - (a+c+e) \quad (7) \quad (a+b+c+d+e+f)$$

を演算してオフセット信号を抽出し、このオフセット信号を上記のオフセット信号成分を含むトラッキングエラー信号から減算することで、オフセット信号を除去したトラッキングエラー信号を得る。また、フォーカスエラー信号は、ナイフエッジ法により

$$(a+b+c+g) - (d+e+f+h) \quad (8) \quad (a+b+c+d+e+f+g+h)$$

を演算して抽出する。

【0056】図13～図15に示した第1～第3実施の形態によると、部品点数および調整工数をさらに削減することができ、簡単なつづみ面にできる。

【0057】なお、本発明は上述した分離型の情報記録再生装置に限らず、一体型の情報記録再生装置にも有効に適用することができる。この一実施の形態には、例えば特開昭61-94246号公報に開示されているように、ディスク状記録媒体に1本のメインビームと2本のサブビームとを有する3ビームを、サブビームのようにトラッキング間隔を持ち、メインビームとサブビームとの間隔が1/2トラッキングピッチを持つように照射する場合にも、本発明を有効に適用することができる。この場合には、各ビームの戻り光をトラッキングの方向と平行な分割線で2分割した受光領域を有する光検出器で受光し、少なくとも一方のサブビームを受光する光検出器の2分割受光領域の出力差をゲイン調整した信号と、メインビームを受光する光検出器の2分割受光領域の出力差信号とを加算してオフセット信号のみを抽出し、このオフセット信号に基づいてSPMの回転数を制御すると共に、

に、オフセット信号を、3ビーム法によって得られるオ

13

フセット信号成分を含むトラッキングエラー信号から減算して、オフセット信号成分を除去したトラッキングエラー信号を得、これによりトラッキングサーボを行なう。

【0058】また、特開7-320287号公報に開示されているように、ディスク状記録媒体に1本のメインビームと2本のサブビームとを有する3ビームを、サブビームどうしが1/2トラッキングピッチ間隔を持つて照射する場合にも、本発明を有効に適用することができる。この場合には、各サブビームの戻り光を上記と同様に2分割した受光領域を有する光検出器で受光して、各光検出器の2分割受光領域の出力差を加算することによりオフセット信号のみを抽出し、このオフセット信号を用いて上記の場合と同様にSPMの回転数を制御すると共に、トラッキングサーボを行なう。

【0059】【発明の効果】以上のように、本発明によればディスク状記録媒体からの戻り光を利用して対物レンズのシフトによるオフセット信号を抽出し、そのオフセット信号に基づいてスピンドルモータの回転数を制御するようにし、簡便かつ安価な回路構成で、分離光学系を採用する場合でもスピンドルモータの回転数を適正に制御でき、ディスク状記録媒体自体の偏心やスピンドルモータへのチャッキング誤差による偏心に起因する追従誤差を抑制して記録再生特性の劣化を有効に防止することができ、

【図面の簡単な説明】

【図1】 本発明による光学ピックアップ装置の第1実施の形態の全体の概略構成を示す図である。

【図2】 図1に示す第2の光検出器の構成を示す図である。

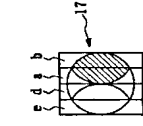
【図3】 第1実施の形態における信号処理回路の構成を示すブロック図である。

【図4】 その動作を説明するためのフローチャートである。

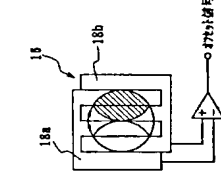
【図5】 第1実施の形態に使用する第2の光検出器の二つの変形例を示す図である。

【図6】 本発明による情報記録再生装置の第2実施の

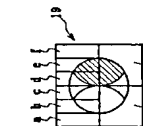
【図8】



【図9】



【図10】



【図11】

